Factors associated with raised pulmonary arterial pressure on echocardiography

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Aim: The significance of coincidentally raised pulmonary arterial pressure in patients undergoing transthoracic echocardiography (TTE) for left ventricular systolic dysfunction (LVSD) is unknown. We attempted to identify echocardiographic or clinical features associated with increased pulmonary arterial pressures in a patient cohort.

Methods: 454 transthoracic echocardiography (TTE) reports of subjects screened for suspected heart failure were analyzed retrospectively. 200 subjects had measurable TR. The peak TR velocity was estimated using continuous wave Doppler, and transtricuspid pressure gradient (TPG) calculated using a modified Bernoulli’s equation (4V²). 26% of patients investigated with transthoracic echocardiography for suspected heart failure had pulmonary hypertension defined as transthoracic pressure gradient (TPG) of at least 30mmHg (Tan et al 2004).

Results: There was a significant positive correlation between TPG and age (Spearman’s rank correlation coefficient=0.169, p<0.01). Right atrial dilatation (n=51, means=standard deviation=33.1±14.55 versus 24.8±7.70mmHg, two-tailed Student’s t-test, t=3.87, d.f=60, p<0.001) and right ventricular dilatation (n=29, 32.3±15.28 versus 26.1±9.79, d.f=59, p<0.001) were associated with a rise in TPG. TPG was higher in subjects with at least moderate mitral regurgitation (n=51, means=standard deviation=29.2±17.30 versus 21.2±12.90, d.f=49, p=0.008). LVSD was associated with a significant increase in TPG (n=48, 31.4±13.48 versus 25.6±9.83, d.f=47, p=0.001). There was no direct correlation between severity of LVSD and TPG (Spearman’s rho=0.097, p=0.618). TPG appeared to be lower in subjects with left ventricular hypertrophy (n=47, 23.8±6.62 versus 27.9±11.26, d.f=46, p<0.05, p=0.019).

Conclusion: Age, right atrial and ventricular enlargement, at least moderate MR and LVSD are associated with higher pulmonary arterial pressures on TTE. No significant association was observed with aortic stenosis, aortic regurgitation, left ventricular diastolic dysfunction, or a reported history of ischaemic heart disease, myocardial infarction, systemic hypertension and obstructive airways disease.

Echocardiography in heart failure

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Aim: We studied the effects of Nebivolol and Carvedilol on Left Ventricular (LV) function in patients with Non-Ischemic Dilated Cardiomyopathy (NIDC).

Methods: Seventy-two patients with angiographically proven NIDC, NYHA functional class II-III, LV Ejctioon Fraction (EF) <40%, clinical stable during last month, being on conventional treatment, randomized to Nebivolol or Carvedilol (target dose 5 and 6.25mg twice daily, respectively). An echocardiographic study and exercise test with Naughton protocol performed at baseline, 3 and 12 months after to all patients.

Results: Thirty-four pts assigned to receive Nebivolol and 38 to receive Carvedilol. During the 12 months follow-up 4 pts (11.7%) discontinued Nebivolol, while 3 pts (7.8%) stopped Carvedilol. There were no significant baseline differences as concern age, sex, NYHA functional class or LVEF between the two groups.

After 3 months patients at Nebivolol or Carvedilol appears a significant improvement in NYHA class (2.14±0.29 vs 2.62±0.24, p<0.02 and 2.25±0.44 vs 2.55±0.51, p<0.05), a significant increase in LVEF 0.15±0.02 vs 0.15±0.02, p=0.001 and 34.5±11.84 vs 27.5±7.47 (p=0.000 respectively) compared to baseline without any significant further improvement during follow-up. However the intergroup analysis showed that patients on Carvedilol Group showed a significant improvement in LVEF at 3 (p<0.005) and 12 months follow-up (p<0.03) compared to Nebivolol patients.

Advanced diastolic dysfunction regressed to earlier stages in carvedilol patients after 12 months’ treatment (p=0.01), while in the nebivolol group, a significant improvement in diastolic dysfunction was found at the 12 months’ follow-up (p=0.02).

Exercise duration improved in both groups at 12 months’ follow-up (both p<0.01), but in the nebivolol group there was an initial deterioration at 3 months (p=0.07).

Conclusions: Both nebivolol and carvedilol appear relatively safe, with beneficial effects on LV systolic and diastolic function as well as exercise capacity in pts with NIDC after 12 months’ treatment. However, carvedilol exhibits more favorable effects on LV function than does nebivolol.

250 Diastolic Doppler indices contribute to the evaluation of levosimendan therapy for congestive heart failure

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Introduction: Levosimendan (LEV) is a potent calcium sensitizer which enhances cardiac performance without apparently impairing normal diastolic ventricular relaxation. LEV has been suggested as a supplementary treatment for congestive heart failure (CHF) when standard classes of drugs - diuretics, ACE inhibitors, b-blockers or digoxin - are insufficient. The purpose of this study is to evaluate by diastolic Doppler indices the action of LEV on patients (P) with CHF.

Methods: We recorded 34 consecutive hospitalized P (27 males and 7 females of mean age 68±9.35 years) with CHF- NYHA functional class III or IV and left ventricular ejection fraction (LVEF) less than 35% and moderate to severe mitral regurgitation for a nine-month period. Conventional drugs were used in 18 P whereas LEV was administered in 16 P in addition. The two groups of P did not differ concerning sex, age, etiology of CHF, any concomitant conditions, blood parameters and adherence to therapy. We considered as markers of cardiac diastolic function: a) the E/A ratio of the transmitral flow (TMF) by pulsed wave Doppler LEV: E and A are respectively the early and the late peak diastolic velocity of TMF (m/s); b) and the E/e’ ratio - is the early peak diastolic velocity of the mitral annulus (m/s) by pulsed Tissue Doppler Imaging and is independent of preload. Both ratios were measured on admission and 24-48 hours after administration of LEV and, if elevated, are predictors of bad prognosis. Data were expressed as “mean value±standard deviation”, statistical analysis was performed by the student's t test and p <0.05 was considered statistically significant. As regards P under LEV: the E/e’ ratio and E/A ratio were significantly decreased from 2.31±1.13 to 1.53±0.95 (p<0.05) and from 4.28±3.11 to 16.49±7.77 (p<0.05) respectively. On the other hand, the indexes of P under usual therapy did not change significantly. Mean E/e’ ratio from 3.1±1.12 to 1.6±0.92 (p=NS) and mean E/A ratio from 15.6±4.92 to 12.0±0.64 (p=NS).

Conclusions: Diastolic Doppler indices both by conventional technique and myocardial tissue imaging indicate that levosimendan may have salutary influence on diastolic cardiac function and thus improve prognosis of patients with congestive heart failure.
253  Effects of treatment with erythropoietin on the left ventricular filling pressure in patients with chronic heart failure
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Background: Anemia is frequently found in patients with congestive heart failure (CHF), and has been related to decreased exercise capacity and left ventricular filling pressure. Anemia might offer a useful tool to improve risk stratification in patients with CHF.

Methods: 120 consecutive stable patients were considered (age 62±12; female 28%; beta-block 56%; ischemic CHF 52%; NYHA functional class 1.8, 1160; II/III). The EVR was assessed as ventilation and carbon dioxide production ratios (VE/VCO2 slope) > 35. The EVR was considered alone, might offer a useful tool to improve risk stratification in patients with CHF.

Results: Mean VEP and PAP were 34±5.4% and 47±12 mmHg respectively. Fifty-four out of 120 pts (45%) had VE/VCO2 slope > 35 (median value 35.6±18.3). Mean TDE and E/A values were 183±3.6, 1.7±1.5 respectively. A significant but weak reverse correlation between VE/VCO2 slope and E/A value (r = -0.36; p < 0.01) was found. Furthermore we found a direct correlation between pulmonary systolic pressure and VE/VCO2 slope (r = 0.51; p < 0.01) and between E/A ratio and VE/VCO2 slope (r = 0.244; p < 0.05). Thirty out of 44 pts (68%) with severe CHF had EVR, conversely, 26/76 pts (34%) without severe CHF had EVR.

Conclusion: EVR is an early sensitive signal of deranged cardiopulmonary reflex control. We speculate that the link between EVR, PAP and severe DDE lies in the altered central hemodynamics. Our study shows that EVR might offer a useful tool to improve risk stratification in patients with CHF.

255  Enhanced ventilatory response to exercise is correlated to diastolic dysfunction in patients with chronic heart failure
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Enhanced ventilatory response to exercise (EVR), determined during cardiopulmonary exercise test (CPX), seems to be an independent predictor of worse outcome in patients with chronic heart failure (CHF) with poor prognoses. Conversely, EVR, considered alone, might have a limited prognostic weight. It is well known that diastolic dysfunction (DD) and pulmonary hypertension (PH) play a major role for the prediction of outcome in patients with CHF. The aim of this study was to evaluate the possible correlation between EVR, pulmonary hypertension and DD, measured by Echocardiography (ECG), in patients with CHF and left ventricular ejection fraction (LVEF) < 45%.

Methods: 120 consecutive stable patients were considered (age 62±12; female 28%; beta-block 56%; ischemic CHF 52%; NYHA functional class 1.8, 1160; II/III). The EVR was assessed as ventilation and carbon dioxide production ratio (VE/VCO2 slope) > 35. DE considered parameters were: pulmonary systolic pressure peak (RAP), transmural E wave (E) and A wave (A) velocity. E/A ratio and E:deceleratio time (EDTA). Severe DD was defined by E/A ratio > 1 and EDT < 140 msec, and was present in 44 pts (37%).

Results: Mean LVEF and RAP by DE were 34±5.4% and 47±12 mmHg respectively. Fifty-four out of 120 pts (45%) had VE/VCO2 slope > 35 (median value 35.6±18.3). Mean TDE and E/A values were 183±3.6, 1.7±1.5 respectively. A significant but weak reverse correlation between VE/VCO2 slope and E/A value (r = -0.36; p < 0.01) was found. Furthermore we found a direct correlation between pulmonary systolic pressure and VE/VCO2 slope (r = 0.51; p < 0.01) and between E/A ratio and VE/VCO2 slope (r = 0.244; p < 0.05). Thirty out of 44 pts (68%) with severe CHF had EVR, conversely, 26/76 pts (34%) without severe CHF had EVR.

Conclusions: EVR is an early sensitive signal of deranged cardiopulmonary reflex control. We speculate that the link between EVR, PAP and severe DDE lies in the altered central hemodynamics. Our study shows that EVR might offer a useful tool to improve risk stratification in patients with CHF.

256  Exercise intolerance in patients with heart failure and preserved left ventricular systolic function: systolic or diastolic impairment?
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Introduction: Impaired diastolic relaxation with stress in patients with heart failure (HF) and preserved left ventricular systolic function (LVFSF) may increase the LV end-diastolic pressure (LVEDP) leading to exercise intolerance. The ratio of early LV filling (E) to early diastolic mitral annular velocity (Em) is a validated estimator of LVEDP. This measured at dobutamine stress echocardiography (DSE) could elucidate the mechanism for this intolerance.
Background: Resistance exercise training is performed in many chronic diseases in order to increase skeletal muscle strength and mass. However, it has not been commonly applied in patients with chronic heart failure (CHF).

Methods: We examined 10 patients with ischemic systolic CHF (9 men, age: 70±6 years, all NYHA class III, left ventricular ejection fraction: 30±6%, peak oxygen consumption: 12±2.3 mL/min/kg). All patients underwent a 12-week training which was based on the resistance exercises of quadriceps muscles (3 times a week, with increasing numbers of exercise series from 3 to 10, and an increasing weight from 0.5 to 2.0 kg applied on exercising lower extremities). Standard echocardiography with 2D measurements, left ventricle ejection fraction (Simpson method), diastolic function (mitral inflow pattern) and other Doppler parameters were assessed before and after the 12-week training, and additionally 16 weeks after the cessation of the exercise program. At the same time, a 6-minute walk test (6MWT), quadriceps strength, lean tissue mass in legs and quality of life (QOL, Minnesota Questionaire) were performed.

Results: All patients finished the 12-week training, and no adverse events were recorded. During the post-training period, 2 patients died, and one underwent CABG and was excluded from the test assessment. Resistance training resulted in a significant increase in quadriceps strength (right: 259±54 N vs. 328±28 N, p<0.0001; left: 264±58 N vs. 342±68 N, p<0.0001), and this effect was also partially seen after the 16-week non-training period (right: 293±54 N, left: 282±38 N; both p<0.05 vs. baseline). This was accompanied by an improvement in exercise tolerance (distance in 6MWT: 444±83 m vs. 559±143 m, p<0.0001; 6MWD: 382±83 m vs. 486±171 m, p<0.001) and QOL (44±4 vs. 33±3 points, p<0.05), and these beneficial changes were partially observed also 16 weeks after the training had been finished (distance in 6MWT: 385±83 m, p<0.05 vs. baseline; QOL: 36±19 vs. 30±1 vs. baseline). During the whole study there were no changes in muscle mass of lower extremities (all p>0.2), as well as in any echocardiographic parameters (LVEF, LVESD, RVEDD, LAVD, duration of mitral and tricuspid regurgitation) (all p>0.05).

Conclusions: The applied resistance training is safe in patients with CHF. It results in an increase of muscle strength and exercise capacity, which is not accompanied by changes in either muscle mass or heart structure assessed during standard echocardiography.

Method: 41 patients with HF and PLVF and 22 age and sex matched controls underwent standard DSE in colour tissue Doppler mode after a 6-minute walk (6MWT), 3 apical views at rest and peak stress, were analysed off-line. Mitral E and A velocities were measures. Systolic mitral annular velocity (Sm) (cm/s) and Sm (cm/s) were measured at 6 positions around the mitral annulus and averaged. Peak and undershoot time (T1, T2, T3) was used to compare in patients with chronic heart failure.

Methods: Thirty patients, who were admitted to our hospital for management of decompensated heart failure, aged 46-70 years, were eligible for enrolment. This study was designed as a randomised, placebo-controlled research. All patients underwent echocardiographic examination and 6 minute walk test. Measurements for study outcomes were made before of treatment (pre-treatment) and after 24 hours (post-treatment). All patients were examined at rest in the left lateral decubitus position. Tissue Doppler parameters also measured and sample volume was placed at the junction of the LV wall with the mitral annulus of lateral and septal myocardial segment from the four chamber view.

Results: Sm increased by 33% at septal segment, 27% at lateral segment of levosimendan patients versus placebo patients (4.09±1.73 vs 5.45±0.50, p<0.001; 3.76±0.61 vs 4.78±0.79, p<0.001, respectively). This was a pos cor relation betw exercise capacity and Sm, both septal and lateral segments (r=0.64, p<0.01; r=0.47, p<0.01, respectively).

Conclusion: Levosimendan might be expected to increase cardiac contractile force parallel with exercise tolerance, especially Sm velocity. It may a follow-up parameter for recovery of abnormal systolic function in patients with heart failure after treatment.

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Risk stratification in chronic heart failure: incremental prognostic value of Doppler echocardiography and natriuretic peptides

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Aim: In patients with CHF, Doppler echocardiography and tissue Doppler imaging (TDI) provide prognostic information. In such pts, NT-proBNP may also be indicative of a poor outcome. The prognostic impact of NT-proBNP and Doppler echocardiography/TDI has never been compared nor controlled.

Methods: Seventy-three CHF pts (38 ischemic, 36 non-ischemic cardiomyopathy, mean ejection fraction (EF): 31±10%, age 55±10 years) were who were in sinus rhythm, underwent measurements of left ventricular diameter, circumference, EF, mitral, tricuspid annular velocities, deceleration time and TDI analysis of mitral annular velocities. The mitral filling pattern was classified as restrictive or non-restrictive. NT-proBNP measurements were carried out on a Elecsys-2010 bench top analyser (Roche Diagnostics, Germany). A cardiac event (rehospitalization due to worsening CHF, cardiac death, urgent cardiac transplantation) was defined as combined study endpoint.

Results: During a follow-up of 226±169 days, 27 pts suffered an event (rehospitalization due to CHF, n=18; cardiac death n=7; urgent transplantation, n=2). Stepwise multivariable Cox regression analysis identified a restrictive filling pattern (Relative Risk 4.90, 95% CI 2.35-30.1, p<0.001), NT-proBNP (RR: 0.83, 95% CI 2.53-2.29, p<0.001) and mitral annular E' velocity (RR: 3.51, 95% CI 2.91-11.50, p<0.015) as independent predictors of an event. In patients with HFpEF, outcome was significantly worse than in patients without RFP. Likewise, in pts with NT-proBNP = 2285 pg/ml (derived from ROC analysis), the outcome was markedly poorer as compared with pts with NT-proBNP = 2285 pg/ml. A risk stratification model based on the three strongest independent predictors separated groups into those with good, intermediate and poor outcome (event-free survival rates of 78%, 40% and 0%, respectively).

Conclusions: In pts with CHF, NT-proBNP and Doppler echocardiography/TDI provide independent and incremental prognostic information.
### Abstracts

#### 262 Changes in ultrasound lung comets as a guide to treatment in heart failure patients: correlation with NT-proBNP

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**Background:** A reduction in plasma N-terminal pro-BNP (NT-proBNP) level, following treatment, portends a better prognosis in heart failure patients. Ultrasound lung comet (ULC) sign consists of multiple comet-tails fanning out from the lung surface and represents a simple index of extravascular lung water.

**Aim:** to assess whether therapy-induced changes in plasma NT-proBNP are mirrored by changes in ULC in heart failure patients.

**Methods:** we enrolled 40 consecutive (19 females; age 66±11 yrs) in-hospital heart failure patients who performed a simultaneous assessment of plasma NT-proBNP and ULC upon admission and 2.4±1.7 days after, prior to discharge. A patient ULC score was obtained with an echocardiographic scanner by summing the number of comets in each of the scanning spaces in the anterior right and left chest, from second to fifth intercostal spaces. “Responders” to therapy were independently identified by NT-proBNP (>50% reduction) and ULC (>20% reduction) criteria based on reduction of admission values upon discharge.

**Results:** NT-proBNP values were 5454±6475 pg/ml on admission and 4492±1149 pg/ml at discharge (p<0.001). ULCs were 24±17 on admission and 17±18 at discharge (p<0.01). There was a weak, albeit significant, correlation between changes from admission to discharge in NT-proBNP and ULC (rs=0.33, p<0.03).

The overall concordance between NT-proBNP and ULC criteria of responsiveness was 65%.

#### 263 Doppler Tissue Imaging as a marker of heart failure in patients with isolated left ventricular diastolic dysfunction; relationship with brain natriuretic peptide

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**Background:** Doppler tissue imaging (DPI) is a sensitive, accurate and reproducible tool for early diagnosis of LV dysfunction.

**Key Words:** Mitral Annular Motion – Doppler Tissue Imaging – Brain Natriuretic Peptide

#### 264 Alterations of proinflammatory cytokines and natriuretic peptide levels during long term carvedilol treatment in dilated cardiomyopathy

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**Aim:** to assess whether therapy-induced changes in plasma NT-proBNP are mirrored by changes in ULC in heart failure patients.

**Methods:** we enrolled 40 consecutive (19 females; age 66±11 yrs) in-hospital heart failure patients who performed a simultaneous assessment of plasma NT-proBNP and ULC upon admission and 2.4±1.7 days after, prior to discharge. A patient ULC score was obtained with an echocardiographic scanner by summing the number of comets in each of the scanning spaces in the anterior right and left chest, from second to fifth intercostal spaces. “Responders” to therapy were independently identified by NT-proBNP (>50% reduction) and ULC (>20% reduction) criteria based on reduction of admission values upon discharge.

**Results:** NT-proBNP values were 5454±6475 pg/ml on admission and 4492±1149 pg/ml at discharge (p<0.001). ULCs were 24±17 on admission and 17±18 at discharge (p<0.01). There was a weak, albeit significant, correlation between changes from admission to discharge in NT-proBNP and ULC (rs=0.33, p<0.03).

The overall concordance between NT-proBNP and ULC criteria of responsiveness was 65%.

**Conclusion:** in heart failure patients, ULC changes somewhat mirror therapy-induced variations in plasma NT-proBNP, and offer a non-invasive bedside, inexpensive alternative to objectively monitor therapy efficacy. The prognostic meaning of discordant results (more often with NT-proBNP reduction with persistent ULC) remains to be established.
This study was to assess the value of pulmonary venous (PV) flow pattern in heart failure (HF). There was found. There was also significant correlation between E/A ratio and RVSP (r=0.43; p<0.001). In multivariate regression analysis only RVSP was independent from left ventricular (LV) size and ejection fraction (EF).

Background: Left ventricular restrictive filling pattern (RFP) is shown to be a predictor of lower survival rate and reduced exercise capacity in patients with heart failure. Heart failure (HF) is characterized by increased cytokines and nitric oxide levels.

Aim: The purpose of the study was to assess the relationship between LV filling pattern and proinflammatory cytokines, BNP level, parameters of exercise capacity and pulmonary hypertension in patients with clinically stable heart failure.

Methods: In 70 patients (age 52±10 yrs, LV EF 27±8%, NYHA class 2±0.8) a complete echocardiographic study and cardiopulmonary exercise test with assessment of peak VO2 and VE/VO2 slope (index of excessive exercise ventilation) were performed. BNP was measured using RIA method, and levels of soluble receptors of TNF-alfa (sTNF-R1, sTNF-RII) and interleukine 6 (IL-6) were measured using ELISA R&D Systems assay.

Results: There were 35 pts with ischemic and 35 pts with dilated cardiomyopathy. According to Doppler transmitial filling pattern 30 pts had restrictive (E/A<2 or E/Ea >13) (RFP group) and 40 pts non-restrictive filling pattern (non-RFP group). There was no significant difference in LV dimensions or LVEF between the two groups. The RFP group showed increased levels of BNP (90±6±6 vs 50±2±1 pg/ml; p=0.003), sTNF-R1 (1518±358 vs 1245±550 pg/ml; p=0.03) and sTNF-RII (3042±910 vs 2076±891 pg/ml; p=0.08). Peak VO2 was significantly reduced in RFP group compared to non-RFP (15±17 vs 17±6±5 ml/minute/m²; p=0.02). E/Ea ratio and RVSP (r=0.26; p=0.02) was significantly increased. A significant correlation between E/Ea ratio and RVSP (r=0.55; p=0.0003). In multivariate regression analysis only RVSP was independently associated with DTE.

Conclusion: The restrictive filling pattern is associated with increased right ventricular systolic pressure, increased BNP level, and worse results of cardiopulmonary exercise test. Increased intracardiac pressures may be responsible for the increased neurohormonal activation and excessive ventilatory response to exercise in patients with HF.

Pulmonary venous flow pattern is unreliable in atrial fibrillation to indicate heart failure

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Heart failure (HF) is associated with increased left ventricular filling pressure (LVFP). Mitral filling pattern has been used to assess LVFP in sinus rhythm (SR). In atrial fibrillation (AF) however other techniques are searched. The purpose of this study was to assess the value of pulmonary venous (PV) flow pattern in HF patients with SR or AF. LV end-diastolic (LVED) and systolic (LVES) flow velocities were measured, E/A ratios and S/D ratios were calculated by standard transthoracic echocardiography. 59 patients (31 males) were prospectively studied and were divided into four groups: 1) AF, no HF (16 pts, age 75±9 yrs, EF 52±14%, LVED and LVES 64±9 and 21±6 mmHg); 2) AF, LV systolic dysfuncion (LVEF<50%); 3) SR, LV systolic dysfunction; 4) SR, no HF (16 pts, age 75±9 yrs, EF 50±18%, group 3 SR and HF (12 pts, age 73±3 yrs, EF 47±9±10%, group 4 SR no HF (12 pts, age 75±3 yrs, EF 66±8%). Group 2 pts were significantly older (p<0.05). LV systolic pressure was significantly higher in group 2 (17±7±3 mmHg vs 72±3±10 mmHg, p<0.05). PV S/D was equally low in group 1 and 2 (0.43±0.07 and 0.38±0.15, NS), but significantly lower in group 3 (0.03±0.03) than in group 2 (p<0.02). In group 4 S/D was higher in each other group (1±4±0.37, p<0.0001). PV S/D was significantly and inversely related to E/A ratio (4.0±0.7; p=0.01). There was no correlation between PV S/D and age in the whole group. Conclusion: pulmonary venous S/D ratio is useful to distinguish between HF and no HF in patients with SR but it is unreliable in the diagnosis of HF in patients with AF.

The functional class is related to the E/Vp ratio in patients with dyspnea

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Aim: Although the analysis of the pattern of transmitial flow is much used in order to evaluate the diastolic function of the left ventricle (LV) and supplies valuable information for the management of heart failure (HF), its use in the general population has not been completely demonstrated. The purpose of this work was to investigate in a multicenter study the relation between the E wave and the mitral inflow propagation velocity ratio (E/Vp) with E/A, anteropulmonary plane displacement (APD), vein ejection fraction (EF) and functional class according to the New York Heart Association (NYHA).

Methods: We studied 215 patients, aged 66±9, obtained from a sample of 432 people that said they suffered from dyspnea. The subjects were sent to their hospitals where an echo-Doppler study was undergone and a questionnaire was filled in. Of the 432 subjects we obtained a positive response from 215 and the study was completed with 190.

Results: For the whole population E/Vp was 1.1±0.42; E/A 0.8±0.23; tsi 0.39±0.14; APOD 11±1±5 and EF 62±8. When we compared E/Vp with NYHA I (n=40), 1.0±0.54, NYHA II (n=83), 1.0±0.45, NYHA III, 1.5±1.5, we obtained p=0.001.

Conclusions: E/Vp correlates well with other Doppler parameters and it is useful to evaluate the severity of HF in a population with dyspnea. The fact that the increase of the ventricular relaxation is minimized makes E/Vp a good index of left ventricular filling pressure.

The wedge score for noninvasive grading of pulmonary capillary wedge pressure in patients with various cardiac diseases

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Background: There is no echo-Doppler method that is accurate enough to estimate pulmonary capillary wedge pressure (PCWP) in a broad range of patients including those with normal or dilated LV volumes, preserved or impaired systolic function.

Objectives: To develop a semiquantitative index for noninvasive assessment of PCWP that is independent from left ventricular (LV) size and ejection fraction (EF).

Methods: Patients (n=151) underwent an echo-Doppler within one hour of cardiac catheterization. The study group consisted of patients with LV dysfunction (EF <55%) without diastolic (LV end-diastolic diameter index <32 mm/m²), n=40, LV dysfunction with diastole, n=56, and aortic stenosis (ET <6±0%), n=49. Variables were examined at linear regression analysis and those that were significant predictors of PCWP in the stepwise regressions entered in the model and categorized at cut-off points. They were subsequently organized in a four-point scale (from 2-10-8) according to the results of an interactive logistic stepwise procedure. The Wedge Score was calculated as the sum of individual scores.

Results: The Wedge Score resulted of variables of mitral flow, pulmonary venous flow pattern, left atrial size and global fractional shortening, and pulmonary artery systolic pressure. High correlations were obtained between Wedge Score and PCWP that is independent from left ventricular (LV) size and ejection fraction (EF).

Conclusion: The Wedge Score may provide a simple, and reliable method for noninvasive assessment of PCWP in patients with normal or dilated LV volumes and preserved or impaired EF.

How interpret exercise induced changes in E/Ea in patients with systolic heart failure

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Background: Exertional dyspnea is frequently due to exercise-induced increases in left ventricular (LV) filling pressure which might result from diastolic dysfunction or dynamic mitral regurgitation (MR). We sought to examine the exercise-induced changes in E/Ea in patients with systolic heart failure. E/Ea is increasingly used as reliable indicator of LV diastolic function.

Methods: Forty-six consecutive patients underwent measurement of effective regurgitant orifice (ERO) of MR and of E/Ea (mean early diastolic mitral annular velocity at tissue Doppler imaging) at rest and during semi-exercise supine test.

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271 Systolic and diastolic function in patients with acute pulmonary edema and hypertension

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Background: Patients (pts) hospitalized with heart failure may later be noted to have normal systolic function, as evidenced by a normal left ventricular ejection fraction (LVEF). In this setting, the hypothesis has been presumed to be due to isolated diastolic dysfunction. Pts with acute pulmonary edema (APE) often have marked systolic hypertrophy but lack adequate heart failure (HF) symptoms and signs, has been presumed to be due to isolated diastolic dysfunction. APE and systolic pulmonary edema (APE) often have marked systolic hypertrophy but lack adequate heart failure (HF) symptoms and signs.

Methods: We studied 48 pts (26 men and 22 women; mean age 66±14 years) with APE and a systolic blood pressure >160 mmHg. Two-dimensional transesophageal echocardiography with color Doppler imaging was performed in each patient as they were transferred from the anesthesia recovery room to the intensive care unit. The first and second echocardiograms were obtained within 2-4 hours after clinical stabilization had occurred, so that the patient was normotensive and pulmonary congestion resolved. We evaluated the EF (Simpson), the presence and the severity of any MR and the wall motion score index (WMSI; 18-segment model).

Results: The mean systolic blood pressure was 192±28 mmHg during the initial transthoracic echocardiogram and was reduced to 132±16 mmHg (p=0.05) at the time of follow-up examination. The EF was similar during the acute episode (52±18%) and after treatment (51±15%). The EF after treatment correlated directly with the EF during the acute episode (r=0.85, p<0.01). The left ventricular WMSI was also the same during the acute episode (1.5±0.5) and after treatment (1.5±0.5). The WMSI at follow up correlated directly with the index at presentation (r=0.95, p<0.01). No patient had severe MR during the acute episode. 26 patients (54.1%) had normal EF (>50%) after treatment. In 20 (80.0%) of these 26 pts the EF was >50% during the acute episode.

Conclusion: In pts with hypertensive APE, the EF during the acute episode is similar to that after treatment, when the blood pressure has been normalized and pulmonary congestion resolved. A normal EF after the treatment of a patient with hypertensive APE indicates a high probability that pulmonary congestion was due to isolated, transient diastolic dysfunction, since transient diastolic dysfunction and/or severe MR are infrequent during acute episodes in these pts with mean systolic velocities significantly improved from 0.95±0.01 m/s (lateral wall) and 0.98±0.01 m/s (antero-septal wall) to 1.3±0.01 m/s (p<0.001). For RV velocities increased from 1.0±0.23 m/s to 1.78±0.10 m/s after surgery (p<0.001). The E/A ratio significantly decreased from 1.4±0.38 to 1.0±0.15 after surgery. The mean systolic velocities significantly increased from 0.95±0.01 m/s (lateral wall) and 0.98±0.01 m/s (antero-septal wall) to 1.3±0.01 m/s (p<0.001). For RV velocities increased from 1.0±0.23 m/s to 1.78±0.10 m/s after surgery (p<0.001). The E/A ratio significantly decreased from 1.4±0.38 to 1.0±0.15 after surgery.
The linear regression equation is: IVRT = [tPA systolic pressure in post LV injection phase - tPA diastolic pressure in post LV injection phase] / β*.

The IVRT value has been compared in the three groups: group I: 51.79 ms; 8.35 STD, group II: 74.19 ms±10.51 STD, group III: 108.27 ms±16.43 STD. The IVRT values between the three groups have significant differences (P<0.0001).

An IVRT = 77 ms predicted pulmonary artery systolic pressure (Post LV injection) = 50 mmHg with a sensitivity of 93% and a specificity of 88%.

Conclusion: We conclude that the evaluation of soothie relaxation time from tricuspid annulus by Doppler tissue imaging provides a simple, rapid and non-invasive tool for estimating pulmonary pressure in patients with Valvular; Coronary and Congenital heart disease.

275 Ultrasound lung comet as a bedside sign of cardiogenic dyspnea
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Background: Ultrasound lung comet (ULC) is a simple sign of extra vascular lung water generated by water-brickened subpleural interstitial fluid. Differentiating congestive heart failure from non-cardiogenic causes of dyspnea is very important for patients presenting in the emergency department with acute dyspnea.

Aim: To assess whether ULCs could differentiate cardiogenic from non-cardiogenic causes of dyspnea.

Methods: ULC was assessed by commercially available echocardiographic instrument (standard in 25, portable unit in 26) in 53 patients (22 females; age 71±13 yrs) presenting to the emergency department with acute dyspnea. The accuracy of the method for etiologic diagnosis was compared on the basis of the final diagnosis established by physicians who were blinded to ULC findings.

Results: ULC assessment could be obtained in all patients (feasibility=100%). The imaging and analysis time was always <2'. ULC were 33±25 in the 41 patients with cardiogenic and 16±22 in the 12 with pneumogenic dyspnea (p<0.05). A ROC analysis identified 7 ULCs as the best diagnostic cut-off to separate cardiogenic from non-cardiogenic dyspnea (Figure) with 95% sensitivity and 67% specificity.

Conclusion: In patients admitted to the emergency department with acute dyspnea, ULC is a simple, highly feasible, effective tool to identify the cardiac origin of dyspnea through indirect imaging of extra-vascular lung water.

276 Accuracy and long-term prognostic significance of semiquantitative assessment of left ventricular contractile reserve in idiopathic dilated cardiomyopathy
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Background: It has been repeatedly shown that quantitative assessment of various indices of left ventricular contractile reserve (LVCR) assessed by high-dose dobutamine stress-echocardiography (DSE) has major prognostic significance. However, the separation between quantitative and semiquantitative LVCR assessment was not found intra- and inter-group differences with regard to left ventricular end-diastolic diameter (50,8±5,6mm vs 52,2mm±6,8mm initially and 50,016,0 vs 50,8±5,6mm at 12 months, gr. I vs gr. II p=NS).

Methods: LVCR was defined as the difference between LVEF obtained at peak dobutamine dose and the baseline values. Patients were considered to have preserved LVCR if dobutamine induced changes in LVEF was >5%. Patients were followed for five years for cardiac death.

Results: A total of 27 (45.8%) patients died during the follow-up. According to Kabicz-Heier analysis preserved LVCR assessed either quantitatively or semiquantitatively identified patients with more favorable prognosis. However, the separation was the best when LVCR was assessed semiquantitatively by DSE expert and experienced reader respectively (96.3 and 95.99, respectively, p<0.001 for both), followed by quantitative assessment (log rank 9.76, p=0.0018) and assessment by novice reader (log rank 8.76, p=0.012). Kappa agreement for interobserver variability for dobutamine induced change in LVEF between quantitative and semiquantitative assessment was 0.34, 0.47 and 0.83 for novice and experienced reader and DSE expert, respectively.

Conclusions: Our data demonstrate that semiquantitative assessment of LVCR has superior prognostic significance to quantitative approach assessed by experts. On the other hand, accuracy of semiquantitative assessment of LVCR is low, if not assessed by DSE expert.

277 Heart failure independently predicts death in acute myocardial infarction complicated by new atrial fibrillation in patients under 65 years
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Objectives: We examined patients' clinical and echocardiographic characteristics and outcomes associated with new atrial fibrillation (AF) in the setting of acute myocardial infarction (AMI) in patients under 65 years.

Methods: We examined 320 patients under 65 years of age with AMI, comparing patients with AF (n=114) to those without (n=206). Univariable and multivariable analyses were used to assess relation between baseline factors and development of atrial fibrillation. Correlation analysis through Pearson coefficient was performed to determine relation between clinical parameters and left ventricular ejection fraction (LVEF).

Results: Patients with AF had more often anterior Q wave MI, higher peak creatine kinase (CK) levels, more advanced heart failure (HF) as well as more extensive LV systolic dysfunction. They were also more likely to have had a history of diabetes mellitus and previous angina pectoris. Significant multivariable predictor of AF was worse Killip class. Lower LVEF highly correlated with previous MI (p<0.0001), anterior MI (p<0.0001), congestive HF (p<0.0001), CK levels (p<0.001) and risk for development of AF (p=0.001).

The unadjusted in-hospital mortality rate was significantly higher in patients with AF (14%) than in patients without AF (6.8%), p=0.03. After adjustment for baseline characteristics, the presence of HF (odds ratio [OR]=4.7) was associated with increased in-hospital mortality. The unadjusted mortality rate was significantly higher at 7 year (36.1% vs. 18.8%, p<0.001) in patients with AF. The adjusted 7 year mortality rate remained significantly higher with HF [ORs: 3.3].

Conclusion: HF in AMI complicated by AF independently predicts in-hospital and long term mortality in patients under 65 years, and not the AF.

278 Impact of rate versus rhythm control strategy on left ventricle function in patients with persistent atrial fibrillation, one year follow-up
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Patients with persistent atrial fibrillation (AF) can be managed either by maintaining sinus rhythm using antiarrhythmic drugs and/or electrical cardioversion, or by leaving patients in AF and controlling ventricular rate without attempts to restore sinus rhythm. The rhythm control strategy is not superior to the rate control with regard to total mortality and thromboaemolic complication. There is lack of data concerning influence of these strategies on left ventricular morphology and function.

Study was designed to evaluate in a randomised, multicentre and prospective manner the effect of two therapeutic strategies - rate control or rhythm control on left ventricular morphology and function.

The study group consisted of 205 patients (71 females and 134 males, mean age 60.8±11.2 years) with a mean time of AF duration of 231±8.1±11.4 years. 101 patients were randomly assigned to rate control (Group II) whereas 104 patients were randomized to sinus rhythm (SR) restoration by 3D cardioversion. At one year follow-up patients were divided into subgroups according to antiarrhythmic drug treatment (Group I). At the end of follow-up (12 months) SR was present in 64% of patients in group II.

Echocardiographic examination was performed initially and at month 12. We have found no intra- and inter-group differences with regard to left ventricular end-diastolic diameter (50.6±5.6mm vs 52.3mm±6.8mm initially and 50.9±6.0 mm vs 50.0±5.7 mm at 12 months, gr. I vs gr. II respectively). Left ventricular fractional shortening significantly increased in all study population. Except initial difference between groups (28.6±6.8% vs 29.5±6.9% gr. I vs gr. II p<0.005) any other intra- and inter-group difference was found (35.6±7.4% vs 31.5±5.3% at 12 months, gr. I vs gr. II p>NS).

Presented study suggests that in patients with persistent atrial fibrillation rhythm control has no positive impact on LV morphology and function when compared with rate control.
279 Hypoxia-induced myocardial angiogenesis preserves myocardial function after injection in mouse

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Introduction: Hypoxia can stimulate capillary angiogenesis, but not arteriolar growth.

Aim: To test if hypoxia-induced capillary angiogenesis had beneficial effects after myocardial infarction (MI) in mice.

Methods: Mice were induced by coronary artery ligation in mice exposed to various times of hypoxia (1 and 3 weeks) and functional (echocardiography) and descriptive data were collected for 3 weeks post MI.

Results: Hypoxia exposure prior to MI resulted in better systolic function (Fractional shortening 26.9% for 3 weeks hypoxia, 24.8% for 1 week hypoxia vs 18.2% for normoxia MI, p<0.05), smaller left ventricular systolic function (6.7mm for 3 weeks, 3.9mm for 1 week hypoxia vs 4.4mm for normoxia MI, p=0.05), higher capillary density (79 for the 3 weeks (p<0.01), 73 for 1 week (p<0.05) vs 63 for normoxia MI) and lesser cardiomyocyte hypertrophy (cardiomyocyte area 20.7 µm² for 3 weeks hypoxia vs 24.9 µm² for normoxia MI, p<0.01). Myocardial expression of VegF receptor Flk1 but not VegF protein was associated with better functional outcome.

Conclusions: Hypoxia can provide capillary angiogenesis, intact limitation, preserved cardiac function post-MI and reduced remodeling. Enhanced Flk1-1 expression associated with enhanced left ventricular function and preserved MI. Protection against ischemic injury by hypoxia may be due to increased angiogenesis and reduced hypertrophy.

280 NT-proBNP level and LV function in patients with acute anterior MI treated with primary PCI


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BNP and NT-proBNP are sensitive indicators of cardiac dysfunction and remodeling. During acute myocardial infarction BNP assessments were found to give insight into survival and outcome. In addition, the effects of left ventricular function on the prognostic value of BNP levels are under investigation.

In 76 consecutive patients with acute anterior MI undergoing primary percutaneous intervention (PCI), 12 hours from the onset of AMI symptoms with TIMI 3 flow in the artery after the procedure, treated according to current guidelines, we tried to assess the relationship of predischarge NT-proBNP level and echocardiographically assessed indices (LV ejection fraction, wall motion score index (WMSI), perfusion index for all segments (PSI) and PSI limited for dysfunctional segments (PSIdysl), assessed for two time points: hospital presentation (index 0) and at 1 month follow-up (index 1).

Results: EF0 and EF1 were significantly negatively correlated with NT-proBNP level (Spearman R=-0.50 and -0.48, both p<0.001). Similarly correlations were found for PS00 and PS10 (R=-0.47 and -0.41; both p<0.01). Positive correlation were found for WMSI0 (R=0.58, p<0.001), WMSI1 (R=0.54, p<0.001) and for highest CKMB level (R=0.37, p<0.01). Correlation coefficient trended positively but did not achieved significance for time from symptoms onset to PCI (R=0.23, p=0.09).

Conclusions: NT-proBNP level at discharge after acute anterior myocardial infarction was highly correlated with echocardiographic indices of left ventricular function and perfusion. The results were maintained for 30 day observation. Further follow-up will determine its impact on outcome and prognosis in acute MI.

281 Optimal time for BNP assessment after acute myocardial infarction

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Background: After acute myocardial infarction (AMI), elevated BNP value is an independent predictor of cardiovascular outcome. However, optimal time to assess BNP level is unclear.

To clarify this point, we aimed to evaluate the accuracy of serial BNP measurements for the prediction of left ventricular (LV) dysfunction and identification of high risk patients (HR).

Methods: Seventy five patients (61±14 years, 61 men) admitted for a first identification of AMI were included. BNP was assessed at day 1 (D1), day 3 (D3) and day 7 (D7). LV dysfunction was defined by an ejection fraction (EF)<45% (echocardiography, delayed gadolinium enhancement). Results were collected at the time of admission and at follow-up time.

Results: Optimal accuracy to identify LV dysfunction and HR patients was obtained by measurement of BNP at D3 (Table). In contrast, D1 and D7 lacked sensitivity and specificity respectively. Furthermore, BNP at D3 (>0.2 µg/ml, p<0.001) was better correlated to LVEF compared to D1 (r=0.28, p<0.02) and D7 (r=0.44, p<0.0001).

Conclusion: After AMI, optimal time to assess BNP is around D3. Earlier or later assessment of BNP lacks sensitivity or specificity to predict patients outcome.

282 NT-proBNP level and left ventricular function in patients with acute anterior myocardial infarction treated with primary percutaneous coronary intervention


Kutnow, Poland

BNP and NT-proBNP are sensitive indicators of cardiac dysfunction and remodeling. During acute myocardial infarction BNP assessments were found to give insight into survival and outcome. In addition, the effects of left ventricular function on the prognostic value of BNP levels are under investigation.

In 76 consecutive patients with acute anterior MI undergoing primary percutaneous intervention (PCI), 12 hours from the onset of AMI symptoms with TIMI 3 flow in the artery after the procedure, treated according to current guidelines, we tried to assess the relationship of predischarge NT-proBNP level and echocardiographically assessed indices (LV ejection fraction (EF), wall motion score index (WMSI), perfusion index for all segments (PSI) and PSI limited for dysfunctional segments (PSIdysl), assessed for two time points: hospital presentation (index 0) and at 1 month follow-up (index 1).

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Conclusions: NT-proBNP level at discharge after acute anterior myocardial infarction was highly correlated with echocardiographic indices of left ventricular function and perfusion. The results were maintained for 30 day observation. Further follow-up will determine its impact on outcome and prognosis in acute MI.

283 Maximum longitudinal relaxation velocity of the left ventricle. Its clinical value and relationship with NT-proBNP plasma levels in heart failure

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Sensitivity Specificity AUC p
D1 vs LVD 47 84 0.90 <0.001
D1 vs D3 70 77 0.92 <0.001
D1 vs D7 79 59 0.82 <0.0001
D3 vs LVD 57 99 0.74 <0.0001
D3 vs D1 81 99 0.91 <0.0001
D3 vs D7 86 63 0.76 <0.0001

Diagnosis values of BNP out of ±130pg/ml to identify patients with LV dysfunction (LVD) and high risk patients (HR).

Conclusion: After AMI, optimal time to assess BNP is around D3. Earlier or later assessment of BNP lacks sensitivity or specificity to predict patients outcome.

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LV dysfunction and HR patients by BNP

Sensitivity Specificity AUC p
D1 vs LVD 47 84 0.90 <0.001
D1 vs D3 70 77 0.92 <0.001
D1 vs D7 79 59 0.82 <0.0001
D3 vs LVD 57 99 0.74 <0.0001
D3 vs D1 81 99 0.91 <0.0001
D3 vs D7 86 63 0.76 <0.0001

Diagnosis values of BNP out of ±130pg/ml to identify patients with LV dysfunction (LVD) and high risk patients (HR).

Conclusion: After AMI, optimal time to assess BNP is around D3. Earlier or later assessment of BNP lacks sensitivity or specificity to predict patients outcome.
was adjusted by age. RVm values were higher in NYHA class I compared to II and III.

Conclusions: RVm increases in both heart failure groups, which confirms the known higher RV load in patients with chronic heart failure.

282 Plasma N-terminal fragments of natriuretic peptides predict the risk of cardiovascular events in middle-aged men

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Background: The prognostic significance of N-terminal pro-A-type (NT-proANP) and pro-B-type natriuretic peptides (NT-proBNP) with respect to death from any and cardiovascular causes and atrial fibrillation is not well documented among middle-aged subjects. The aim of this study was to show if both NT-proANP and NT-proBNP are independent predictors of cardiovascular death and death from heart failure in patients with chronic heart failure.

Methods: Plasma NT-proANP and NT-proBNP were measured in a representative population-based sample of 105 men (age 46-65 years) from Eastern Finland. There were 110 deaths (58 cardiovascular deaths and 40 coronary heart disease deaths), 59 cases of arterial fibrillation during an average follow-up of 10 years. Echo-cardiography was performed on 453 men during an 11-year follow-up visit.

Results: NT-proANP (56% confidence interval 1.15 to 1.51) and NT-proBNP (overall death and 1.52 (95% confidence intervals 1.21 to 1.91) for coronary heart disease death for each SD (160.8 pmol/l) increment in NT-proANP, after adjustment for age and other risk factor (smoking, diabetes, systolic blood pressure, family history of coronary disease, presence or absence of coronary heart disease, body mass index, serum LDL and HDL cholesterol, C-reactive protein, serum creatinine). The respective risks were 1.26-fold (95% confidence intervals 1.10 to 1.42) and 1.44-fold (95% confidence intervals 1.22 to 1.60) for each SD (39.8 pmol/l) increment in NT-proBNP. These results were similar for cardiovascular and coronary heart disease death. The multivariate adjusted risks for future atrial fibrillation were 1.46-fold (p<0.001) and 1.72-fold (p<0.001) for each SD increment in NT-proANP and NT-proBNP, respectively. NT-proANP was associated with LV ejection fraction (r=0.237, p<0.001), LV mass (r=0.143, p=0.003) and left atrium diameter (r=0.148, p=0.001), whereas NT-proBNP was related to LV ejection fraction (r=0.242, p<0.001), LV mass (r=0.148, p<0.001) and left atrium diameter (r=0.133, p=0.002).

Conclusions: The present study shows that NT-proANP and NT-proBNP are strong predictors of death from any and cardiovascular causes and atrial fibrillation. NT-proANP and NT-proBNP provide additional prognostic value for identifying patients with high risk of death and its co-morbidities.

288 BNII increases following short-term VVI pacing in asymptomatic patients with decreased left ventricular systolic function: prediction by echocardiographic measurements

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Background: Brain natriuretic peptide (BNP) can be used to monitor cardiac function in patients with ventricular dysfunction. While conventional asynchronous right ventricular pacing (VVI) has been found to increase the BNP levels in patients with normal left ventricular systolic function (LVFS), it is not known whether VVI elicits similar BNP responses in patients with decreased LVFS.

Methods: To examine the BNP responses after short-term VVI pacing we studied 18 functionally stable patients (mean age 68 years) who had been implanted with a dual-chamber automatic defibrillator. There were 48 patients with ischaemic and 10 patients with dilated cardiomyopathy. After the baseline echocardiographic standard, color M-Modes and tissue Doppler (TD) evaluation during atrioventricular (AV) synchrony, the devices were programmed to continuous VVI pacing for 30 minutes individually adjusted slightly above the baseline rhythm (73±11). The BNP levels were measured at baseline, immediately after pacing termination (Time 0), 5, 10, 15, 30 and 60 minutes thereafter.

Results: Patients had mean left ventricular ejection fraction 38±11%. The baseline BNP levels were 166 (99-364) pg/ml and rose to 218 (106-387) pg/ml at Time 0 (p<0.001). In multivariate analysis the baseline BNP correlated with the TDI-D (r=0.43, p<0.001) and the ratio E/E' (p=0.038, p<0.005). The transient post-VVI pacing BNP increases were characterized by a peak value immediately after VVI pacing and then exhibited a slow decreasing trend. The median incremental rise of BNP at Time 0 (BNP at Time 0 minus BNP at BL, 33 (8-68) pg/ml) showed independent positive association with the ratio E/E' (p<0.001).

Conclusions: BNP increases following VVI pacing in asymptomatic patients with decreased LVFS are mainly related to diastolic abnormalities and elevated filling pressures.

287 Bridging the gap between increased aortic stiffness and early left ventricular diastolic dysfunction in essential hypertension: the role of brain natriuretic peptide

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Left ventricular (LV) diastolic dysfunction and increased aortic stiffness represent common sequelae of essential hypertension (EH) associated with adverse cardiovascular outcomes.

Aim: The aim of this study was to investigate the association of BNP plasma levels with aortic stiffness and LV diastolic function in the early stages of EH.

Methods: We studied 106 consecutive newly diagnosed (within the previous 2 years) subjects (aged 54 years, 80 males, office BP = 155/100 mmHg) with stage I-III EH and 50 normotensives matched for age, sex, and BMI. LV diastolic function was estimated by pulsed TDI, averaging diastolic mitral annular velocities measurements (E, A, E'/A, E/A ratio) from four separate sites (basal septal, lateral, anterior, and inferior LV wall). Moreover, all the participants underwent c-3 PWV measurement, as well as blood sampling for the determination of metabolic profile and BNP concentrations.

Results: Hypertensives compared with normotensives exhibited greater Ama 10±1±3 vs 8±8±1±1 cm/sec, as well as lower Ewave and Ewave/Awave values (4±4±1 vs 10±1±6 cm/sec, and 0±92±0±9 vs 1±6±0±6 respectively) p<0.001 for both cases). Hypertensives also had increased BNP levels correlated with c-3 PWV (r=0.41, p<0.001), as well as with LVMI, RWT and c-3 PWV (r=0.312, r=0.328 and r=0.320, respectively, p<0.01 for both cases). Moreover, BNP levels were associated with the E/Awave ratio (r=-0.358, p=0.05), whereas c-3 PWV was correlated with Ewave/Awave ratio (r=0.435, p=0.001), and RWT and office BP (r=0.342 and r=0.327, p<0.01 for both cases).

Conclusions: Aortic stiffness and TDI-detected LV diastolic dysfunction are both associated with BNP plasma levels at the early course of EH. Although these interrelationships are not yet completely elucidated, they may explain the important prognostic role of BNP in various clinical settings.

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Elevated brain natriuretic peptide is associated with abnormal tissue Doppler characteristics in patients with aortic stenosis

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Brain natriuretic peptide (BNP) is expected to be related to left atrial pressure, which can also be estimated using tissue Doppler echocardiography.

Aims: To assess the relationship between BNP level and measures of systolic and diastolic function on Tissue Doppler Imaging (TDI) in patients with aortic stenosis.

Methods: We studied 50 patients with asymptomatic moderate to severe aortic stenosis (ECAO > 1.5 cm²) and normal transverse LV systolic function. The median age was 73 years (range 29-87) and 38 were male. We recorded trans-mitral pulsed Doppler and TDI at the lateral and septal mitral annulus. BNP levels were quantified using a fluorescence immunoassay technique (Triage BNP test, Biosite Diagnostics, Inc).

Results: Log BNP was inversely correlated to both the lateral and mitral annular systolic velocities ($P < 0.01$ and $P < 0.05$ respectively, and directly related to the septal E/E' ratio ($P = 0.034$). ROC curve analysis for an abnormal BNP (>100pg/ml) gave an AUC of 0.8 for the septal systolic velocity and 0.7 for the E/E' ratio. An E/E' ratio > 10 gave a sensitivity of 76% and specificity 30% for a high BNP while a ratio > 15 gave a sensitivity 67% and specificity 87%. A systolic velocity < 5 cm/s was 100% specific and below 8 cm/s 100% sensitive for a high BNP.

Conclusions: These results show that Tissue Doppler indices are related to the BNP level. A systolic velocity < 5 cm/s or E/E' ratio > 15 reliably predict a high BNP level.

Mitral annular motion as a surrogate for left ventricular function: correlation with brain natriuretic peptide levels

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Background: Pulsed-wave (PW) Doppler tissue velocities of the mitral annulus correlate well with Left Ventricular (LV) diastolic(D) and systolic(S) functions. Brain natriuretic peptide (BNP) levels have been shown to be elevated in patients with systolic LV dysfunction(Dys) and correlate to the severity of symptoms and prognosis.

Objectives: To validate the accuracy of mitral annular motion (MAM) assessed by Doppler Tissue Imaging (DTI) & M-mode Echocardiography (MME) as a surrogate for determination of LV function in comparison with BNP.

Methods: A series of 133 patients with a variety of cardiac pathologies referred for echocardiography and 20 healthy age & sex matched volunteers as a control group were included in the study. Ejection fraction (EF) of LV, Doppler recordings of the mitral inflow, MME and PWDTI data (from each of 4 mitral annular sites, anterior, posterior, septum and lateral) were obtained. Mean peak (S) MAM velocity (Sm), mean annular early (E) velocity (Em) by PWDTI and mean mitral anular plane (S) excursion (MAPSE) by MME were calculated by averaging at each annular site.

BNP levels were measured by a rapid immunoassay and blinded to cardiologist making the assessment of LV function.

Results: MAPSE < 12 mm determined by MME has 90% sensitivity, 88% specificity & 85% accuracy for detection of LVEF < 50%, while these values were 94%, 93% & 94% respectively for (S) MAM (Sm) < 8 cm/s determined by PWDTI. BNP level > 75 pg/ml has 98% sensitivity, 90% specificity & 97% accuracy for detection of LV Dys either (S, D or both). BNP levels were significantly higher in patients with combined (S & D) Dys than those with only (S) Dys, the later group had significantly higher BNP levels than those with only (D) Dys, (1054±52±2.3 pg/ml vs. 500±39.9 pg/ml & 500±39.9 pg/ml vs. 215±3±100 pg/ml respectively & each was significantly higher than control group[92±3±5.7 pg/ml, p < 0.001 for all]. Significant correlations ($p < 0.001$ for all) were found between BNP levels and Em ($r = -0.62$) Sm ($r = -0.7$), early transmural (E) to Em ratio ($r = 0.61$), MAPSE ($r = 0.54$), LVES ($r = -0.64$) & LV and D dimension ($r = -0.63$).

Conclusion: MME and PWDTI used for assessment of MAM are useful methods for evaluation of LV function but parameters measured by PWDTI correlate more strongly with plasma BNP levels than those measured by MME and provide a simple, sensitive, accurate and reproducible tool for early diagnosis of LV dysfunction.

Key Words: Mitral Annular Motion – Doppler Tissue Imaging – Brain Natriuretic Peptide

Baseline cardiac structural and functional characteristics and prognostic significance of end stage renal disease patients with elevated N-Terminal Pro-B-Type natriuretic level

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Elevated baseline levels of natriuretic peptides occur in a proportion of patients with end stage renal disease (ESRD). The aim of this study was to identify baseline characteristics and determine the prognostic significance of those renal failure patients with a raised N-terminal pro B-type natriuretic peptide (NTproBNP) level.

Methods: 84 renal transplant candidates (mean age 52±12 years, 75 male, mean creatinine 60±1±2mmol/L) were prospectively studied over a mean follow-up time of 1.66±0.58 years. All had coronary angiography, dobutamine stress echocardiography and baseline biochemical markers. Severe coronary artery disease (CAD) was defined as luminal stenosis > 70% in at least 1 vessel by visual estimation. A baseline NTproBNP level > 125pg/ml was taken as significantly elevated. The primary end point was total mortality.

Results: 50 (59%) patients had elevated NTproBNP levels. This was associated with significantly increased mortality ($p = 0.05$). Those patients had significantly impaired left ventricular (LV) fractional shortening (31±10% vs 41±9%, $p = 0.04$), lower mitral annular systolic velocity (0.06±0.02 m/sec vs 0.09±0.02 m/sec, $p = 0.01$) higher LV end diastolic diameter (5.1±0.9 cm vs 4.4±0.8 cm, $p = 0.04$), and higher LV end systolic diameter (3.1±0.8 cm vs 2.5±0.7 cm, $p = 0.008$) compared to those with NTproBNP levels < 125pg/ml. Diastolic function was significantly impaired in the NTproBNP positive group (E/E' 14±7 vs 11±24, $p = 0.03$, Em'/E' 2.2±0.8 vs 1.8±0.5, $p = 0.05$), as was LV mass index (186±50g/m² vs 140±48 g/m², $p = 0.03$), Age (55±10 years vs 49±13 years, $p = 0.02$) and the proportion of patients on dialysis (68% vs 29%, $p = 0.001$) were significantly higher in the NTproBNP positive group. Diabetes, the percentage of patients with severe CAD and inducible regional wall motion abnormality were similar in both groups. Stepwise logistic regression analysis identified diabetes (OR 12.6, 95% CI 2.9, 45, $p = 0.001$) and mitral annular peak systolic velocity (OR 5.8, 95% CI 1.2 – 9.7, $p = 0.004$) to be independently associated with an elevated NTproBNP. Conclusions: A significantly elevated NTproBNP level was present in 59% of patients with ESRD, especially those on dialysis, and was associated with significantly increased mortality. Its presence signifies LV dilatation and impaired systolic and diastolic function. There was no association with severe CAD or inducible ischaemia.